Morphological selection and representational modularity

MORPHOLOGICAL SELECTION AND REPRESENTATIONAL MODULARITY

PETER ACKEMA & AD NEELEMAN

(Ackema)
Utrecht University
UiL OTS
Trans 10
3512 JK Utrecht
The Netherlands

ackema@let.uu.nl

(Neeleman)
UCL
Department of Phonetics and Linguistics
Gower Street
London WC1E 6BT
UK

ad@ling.ucl.ac.uk

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Realizational morphology rejects the joint insertion of a morpheme's semantic, morpho-syntactic and morpho-phonological properties in favor of distributed insertion in the appropriate components. In this paper, we explore the consequences of this view for morphological selection, which is traditionally defined as the selection by an affix of a zero-level host of a particular category. We argue that the morpho-syntactic part of an affix selects for the category of its host, while the requirement that the host is a zero-level category reduces to the fact that the affix's morpho-phonological part needs material to form a phonological word with. This, in combination with general properties of representationally modular grammars, explains under which circumstances words can contain phrases. In particular, it gives some insight into effects of zero affixation, certain types of bracketing paradoxes and so-called 'mixed categories'.

1. *Modular Selection*

In much work on word formation, morpho-phonological properties of morphemes are strictly separated from their semantic and morpho-syntactic properties. A morpheme is not a unit taken from the lexicon and combined with other morphemes. Rather, its semantic and morpho-syntactic features are inserted in the semantic and morpho-syntactic components respectively, while only the morpho-phonological component contains its overt form. The three representations thus formed must of course be related, something which is achieved by a set of mapping principles. A range of proposals along these lines can be found in Sproat 1985, Anderson 1992, Halle & Marantz 1993, Beard 1995 and Jackendoff 1997, amongst others. We will refer to models of this type as representationally modular (borrowing a term from Jackendoff).[1]

In this paper we explore the consequences of the separation of morpho-syntax and morpho-phonology for morphological selection. It is traditionally assumed that affixes select for an X^0 of a particular category (abstracting away from semantics). For example, the affix *-able* selects a V^0, while the affix *-ize* selects an N^0 (or A^0). Notice that such statements mention two different properties of the selected element. One is its category, the other its bar-level. The former type of selection varies per affix, but the latter type holds of all affixes - indeed, it partially defines the notion 'affix' as commonly understood. Given that the two types of selection are qualitatively different, it would be desirable to distinguish them formally. That such a distinction must be made is in fact implied by the separation of an affix's morpho-syntactic and morpho-phonological properties.

Representational modularity implies that there is no such thing as the selectional requirements of 'an' affix, since affixes are not monolithic entities, but rather the combination of morpho-syntactic and morpho-phonological properties. This means that a distinction must be made between what the morpho-syntactic part of the affix selects in the morpho-syntactic component and what its morpho-phonological part selects in the morpho-phonological representation. We propose that selection for category is associated with the morpho-syntactic part of an affix, while the selection for bar-level is a by-product of its morpho-phonology. The morpho-phonological part of an affix is a dependent category, which, much like a simple clitic in the sense of Zwicky 1977, requires a base to form a phonological word with. In other words, morphological selection does not exist as such. It is the combination of two types of independently motivated selection: categorial selection in the morpho-syntactic component and what one might call phonological selection in the morpho-phonology.

The idea that selectional requirements must be distributed across components is familiar from selection at the sentence level. The separation between the syntactic and the semantic component assumed in most models of syntax makes it possible to distinguish between the syntactic and semantic selectional requirements of a head. As Grimshaw (1979) has shown, it is desirable that this distinction be made. For example, both *ask* and *wonder* select for an interrogative complement in the semantics, but *wonder* in addition selects for a CP in syntax. Hence the contrast between *John asked the time* and **John wondered the time.*

The purpose of this paper is to argue that the separation of morpho-syntactic and morpho-phonological selection is not only conceptually desirable, but has a number of empirical advantages as well. In particular, it explains under which circumstances constituents larger than heads (that is, phrasal constituents) can be parts of words. For example, the morpho-phonological part of certain exceptional affixes can be shown to be a phonological word in its own right. Exactly such affixes are expected not to impose morpho-phonological selectional requirements, with the consequence that they may attach to phrases. In the same vein, representational modularity allows certain affixes not to have a morpho-phonological part at all (zero derivation). In that case, too, no morpho-phonological requirements will be imposed, with the consequence that phrasal derivation is allowed.

Before we turn to the empirical advantages of modular selection in sections 4 through 9, we need to clarify the details of the model that underlies the analysis. The nature of the morpho-syntactic and morpho-phonological components is discussed in section 2, while the mapping principles that relate the two are the topic of section 3. Section 10 presents some conclusions and possible extensions.

2. *Morphology and Modularity*

Representational modularity assumes that phonology, semantics and syntax are independent generative systems associated by mapping principles. In other words, a sentence has a semantic, syntactic and phonological representation, whose wellformedness is determined by conditions particular to the respective components. In addition, grammaticality requires successful association of these representations. At the sentence level, then, the model of grammar we assume (following Jackendoff 1997) is as below.

(1)

Semantics		Syntax		Phonology
↓		↓		↓
Semantic structure	↔	Syntactic Structure	↔	Phonological structure

The motivation for an independent semantic component is not immediately relevant for the argumentation in this paper. The evidence for a separation of syntactic and phonological structure is straightforward: phonological representations are not isomorphic to syntactic representations, and phonological and syntactic primitives are members of disjoint sets. A simple example illustrating this, borrowed from Jackendoff (1997:26), is given in (2). In syntax, *a big house* is a DP that consists of a determiner and a complex NP complement. In phonology, it consists of two phonological words, the first of which is formed by the determiner and the adjective. So, both constituency and labels differ.

(2) a. $[_{DP}$ a $[_{NP}$ $[_{AP}$ big] house]]
b. $[_{\phi}$ $[_{\omega}$ a big] $[_{\omega}$ house]]

There does not seem to a plausible continuation of the syntactic derivation that connects (2a) and (2b) - familiar syntactic derivations operate under informational monotonicity: by hypothesis they can add, but not destroy or change structure and labels (compare Chomsky's (1995) inclusiveness condition; see also Neeleman & Van de Koot 2002). The implication is that (2a) and (2b) are generated separately and associated by mapping principles. Indeed, this is the predominant view in the literature on the syntax-phonology interface (Selkirk 1984, 1986, Nespor & Vogel 1986, Inkelas & Zec 1990, amongst others).

How does morphology fit into this picture? Let us begin by observing that it is not a component on a par with syntax, phonology and semantics. A sentence has a syntactic, phonological and semantic representation, but not a morphological one. Rather, morpho-syntactic representations

are embedded in phrasal syntactic representations. Similarly, morpho-phonological representations are embedded in prosodic structures. It seems, then, that the situation at word level mirrors the situation at sentence level in that there are independent generative systems which define well-formed morpho-syntactic, morpho-phonological and lexical-semantic representations. As is the case at the sentence level, these are associated by mapping principles. The model of grammar in (1) should hence be extended as in (3), following Jackendoff 1997 and Ackema 1999a.

(3)

Semantics		Syntax		Phonology
↓		↓		↓
Semantic structure		Syntactic structure		Phonological structure
EMBEDDING	↔	EMBEDDING	↔	EMBEDDING
M-Semantic structure		M-Syntactic Structure		M-Phonological structure
↑		↑		↑
Morpho-Semantics		Morpho-Syntax		Morpho-Phonology

We assume that the morpho-syntax manipulates hierarchical representations, containing distinct structural positions for the morpho-syntactic part of affixes and other morphemes. We will refer to affixal constituent parts of morpho-syntactic representations as AFFIXes, to be distinguished from /affix/es, which represent the overt form of an affix as inserted in the morpho-phonology. This notation will be generalized to other morphemes where relevant.

In case there is a one-to-one, left-to-right mapping of AFFIXes to/affix/es, the model sketched above is empirically indistinguishable from models assuming joint insertion of morpho-phonological and morpho-syntactic (and lexical-semantic) material. However, differences arise in circumstances in which the mapping is not regular. Consider combinations of causative and applicative morphology. Presumably, the morpho-syntactic structures of a causative applicative and an applicative causative are distinct, with the causative affix c-commanding the applicative affix in the former, while being c-commanded by the applicative affix in the latter. The linear order will reflect this if there is one-to-one, left-to-right mapping (see (4a,a') and (5a,a')). The result by necessity obtains in models assuming joint insertion (see (4b) and (5b)).

(4) a. [[V APPLICATIVE] CAUSATIVE] ↔
a'. [[/v/-/applicative/]-/causative/]
b. [[<V, /v/> <APPLICATIVE, /applicative/>] <CAUSATIVE, /causative/>]

(5) a. [[V CAUSATIVE] APPLICATIVE] ↔
a'. [[/v/-/causative/]-/applicative/]
b. [[<V, /v/> <CAUSATIVE, /causative/>] <APPLICATIVE, /applicative/>]

The advantage of representational modularity is that it can handle cases in which mapping is not one-to-one and left-to-right, while maintaining the appropriate syntactic structures. An example is provided by Chimwi:ni (Abasheikh 1978, Hyman 2001). Post-verbal morphology is templatic in this language. Crucially, the template refers to the /affix/es that spell out applicative and causative, not to the AFFIXes representing these categories in morpho-syntax. In particular, the template requires that the causative /affix/ precedes the applicative /affix/. This does not affect the mapping of

applicative causatives, but it has the consequence that a causative applicative surfaces as in (6b'). Hyman discusses evidence based on passive that the syntactic representation must nevertheless be as in (6b). Such data cannot be handled by the traditional model of joint insertion. (For similar cases from Quechua, see Muysken 1988).

(6) a. *Template*: /causative/ - /applicative/
b. [[V APPLICATIVE] CAUSATIVE] ↔
b'. [[/v/-/causative/]-/applicative/]

The assumption that morpho-syntactic representations are generated by merger of morpho-syntactic constituents is in contrast with two major alternative approaches. Both of these in fact deny the existence of specifically morpho-syntactic structure, but in different ways. In much of the syntactic literature inspired by Baker 1988, the internal structure of morphologically complex heads is derived by syntactic head-to-head movement (modulo possible post-syntactic readjustment rules). In Beard's (1995) Lexeme-Morpheme Base Morphology, there is no such thing as a complex head in morpho-syntax. Rather, where other theories assume complex structures, Beard assumes rules which add features to a base. It is beyond the scope of this paper to discuss these models in detail. Let us instead give some general considerations that in our opinion support the model adopted here.

Deriving morphological constructs by syntactic head-to-head movement faces difficulties in two domains. Empirically, if a structure [X AFFIX] is the result of head movement of X in a structure [AFFIX [$_{XP}$ ... X ...]], then we would expect material that can or must be present in XP to be stranded by movement of X. Although a possible analysis for inflection, such stranding is hardly attested in the case of derivation, if at all (see Bresnan & Mchombo 1995 and Ackema & Neeleman 2001). To give an example, the material contained in the VP in (7a) cannot be present if a synthetic compound is formed, as in (7b).[2]

(7) a. to [$_{VP}$ reluctantly drive [$_{NP}$ a rusty truck] [$_{PP}$ to Arizona]]
b. *[$_{NP}$ a [$_{N}$ [$_{V}$ truck drive] er] [$_{VP}$ reluctantly t_V [$_{NP}$ a rusty t_N] [$_{PP}$ to Arizona]]]

Word formation though head-to-head movement also has a conceptual disadvantage. Syntactic selection holds between chain roots (Chomsky 1981, Brody 1995, Jackendoff 1997). For example, there is no raising to θ-positions. If an affix selects a host after movement, that type of selection would have to be exceptional in this regard (Ouhalla 1991, Lieber 1992).

The second alternative, which denies the existence of hierarchical morpho-syntactic structure altogether, violates the principle of inclusiveness (see above). In fact, the kind of rule needed to add a feature to a stem in the absence of an AFFIX is exactly what inclusiveness is intended to rule out. This is not necessarily a counterargument, but one cannot give up on inclusiveness without developing an alternative restrictive view on possible phrase structures. Simply denying that inclusiveness holds gives rise to an overgenerating syntax, since it is tantamount to denying there should be a connection between the properties of a phrase and those of the material that it contains. More directly problematic, perhaps, are the difficulties this model faces in regulating the order of /affix/es. This order should in principle be random as long as all features present in morpho-syntax have their proper morpho-phonological consequence. However, in the normal case, /affix/ ordering corresponds to the order in which morpho-syntactic operations apply (the mirror principle, see Baker 1985 and Grimshaw 1986). Beard addresses this issue by assuming that morpho-syntactic operations result in layered feature bundles, rather than in unordered sets of features. This is a reasonable assumption, but it negates the basic premise of the model, since it reintroduces morpho-syntactic structure. A layer in a feature bundle can be equated to an AFFIX position.

Let us now turn to the principles that regulate the mapping between morpho-syntactic and morpho-phonological structures.

3. *Mapping*

3.1 *Idiosyncratic mapping rules* A distinction can be made between idiosyncratic mapping rules and more general mapping principles. Idiosyncratic mapping rules are the counterpart of traditional lexical items in representationally modular models. The verb *read*, for example, is represented in the lexicon by the following (highly simplified) mapping.

(8) $\lambda x\, \lambda y$ [READ (x,y)] ↔ [<+V,-N>, ($\underline{\theta}_x$, θ_y)] ↔ /ri:d/

Similarly, an affix like agentive *-er* is a lexical mapping between a semantic, a syntactic and a phonological representation. The specific content of PRED in the semantics in (9) is supplied by the lexical conceptual structure of the verb that *-er* combines with (see Jackendoff 1990 for a formalization). Given that PRED requires specification, a form of morpho-semantic selection results. In addition, the morpho-syntactic AFFIX imposes morpho-syntactic selectional requirements (it selects for a verbal category), while the morpho-phonological /affix/ needs a base to form a phonological word with:[3]

(9) λx [x | PRED (x)] ↔ [<-V,+N>, ($\underline{R}_x$)] ↔ /-ər/
+[<+V, -N> __] +[$_\omega$ /x/ __]

Given that we mainly deal with the mapping between morpho-syntax and morpho-phonology in this paper, we will not explicitly distinguish the morpho-syntax and morpho-semantics of a word or affix in much that follows. For example, in the interest of presentation we will refer to the PLURAL rather than 'the AFFIX associated with the semantics of plurality'.

The idiosyncratic mapping rules that constitute lexical items need not consist of one-to-one mappings. For example, in cases of phonologically conditioned allomorphy, a rule associates a single AFFIX with two or more alternative phonological realizations (two or more /affix/es), whose distribution is sensitive to context. Similarly, in cases of homonymy, we do not need to assume several distinct /affix/es: two or more AFFIXes can be associated with the same phonological form (Beard 1988).[4]

An idiosyncratic mapping rule also need not mention a single morpho-syntactic terminal; it can also apply to combinations of (morpho-)syntactic material. For example, next to the mapping rules that associate TOOTH with /tooth/ and PLURAL with /z/, there is a mapping rule which relates [TOOTH PLURAL] to [/teeth/]. This rule can be formulated as follows, where P(X) stands for the phonological realization of a syntactic entity X:

(10) If PLURAL selects (a category headed by) TOOTH,
then P(TOOTH, PLURAL) = /teeth/

Since this mapping rule is more specific than the one that only mentions PLURAL, the elsewhere principle states that the latter is blocked where the former can apply, ruling out *[/tooth/ /z/]. Note that this does not mean that the lexicon contains multiple morpho-syntactic morphemes that represent plurality (there is only one plural AFFIX).

The type of mapping rule in (10) can be extended to cases of idiosyncratic zero morphology. For example, the fact that the plural of *sheep* is identical to the singular can be stated using the rule in (11):

(11) If PLURAL selects (a category headed by) SHEEP,
then P(SHEEP, PLURAL) = P(SHEEP)

3.2 *General mapping rules* Let us now turn to the more general mapping principles relevant for affixation. To begin with, there seems to be a principle that disfavors 'crossing correspondences' between morpho-syntactic and morpho-phonological structures (see Marantz 1984 and Sproat 1985). This constraint can be formulated as below (compare Sproat 1985:82). Note that without it we would expect massive violation of the mirror principle. Random affix ordering would be the norm.

(12) *Linear Correspondence*
If X is structurally external to Y,
X is phonologically realized as /x/, and
Y is phonologically realized as /y/
then /x/ is linearly external to /y/.

Although we assume that in general mapping principles cannot be violated, languages may sanction violations in particular subdomains of word formation. In fact, we have already seen an example which does not comply with (12). In Chimwi:ni, a morpho-phonological template overrules the ordering that would follow from linear correspondence (see (6)). This does not imply that the whole of Chimwi:ni morphology will fail to comply with (12): violations are restricted to those affixes specifically mentioned by the template.

Moreover, violation of mapping principles does not come for free in those subdomains that allow it: a mapping principle can only be violated if forced by conflicting demands. For example, Hyman (2001) observes that where there is a conflict between the order imposed by (12) and the templatic order, certain Bantu languages allow both. However, if there is no conflict, only one order is allowed. This shows that violation of mapping principles must be triggered.

Linear correspondence favors a particular ordering of /affix/es. Another potentially conflicting mapping principle states which host an /affix/ can attach to. So far, we have implicitly assumed that any host with which the /affix/ can form a phonological word will do. In reality, however, an /affix/ usually combines with the phonological correspondent of (the head of) the category that the AFFIX combines with. This condition, formulated in (13), is equivalent to Sadock's (1991) strong constructional integrity.

(13) *Input Correspondence*
If an AFFIX selects (a category headed by) X,
the AFFIX is phonologically realized as /affix/, and
X is phonologically realized as /x/,
then /affix/ takes /x/ as its host.

If the AFFIX selects a simplex category X, the effect of input correspondence is trivial: /x/ and the /affix/ form a phonological word. In case the AFFIX selects a more complex structure, (13) demands that the corresponding /affix/ forms a phonological word with the phonological realization of the head of that structure, rather than with the correspondent of anything else. In other words, input correspondence favors a mapping of the left-branching morpho-syntactic structure in (14a) onto the right-branching morpho-phonological structure in (14b).

(14) a. $[[_X$ Y X] AFFIX] ↔
b. [[/y/ [/x/ /affix/]]

Mappings of the type in (14) provide an alternative to what Hoeksema (1984) characterizes as 'head operations', morpho-syntactic operations which affect the properties of a complex category by applying to its head.[5]

The effects of input correspondence become particularly clear when we consider cases in which it conflicts with linear correspondence. An example is provided by structures in which a complex left-headed category is selected by an AFFIX that is spelled out by a /suffix/ (see (15a)). For such structures, linear correspondence would favor mapping to (15b), whereas input correspondence would favor mapping to (15b').

(15) a. $[[_X$ X Y] AFFIX] ↔
b. [/x/ [/y/ /affix/]]
b'. [[/x/ /affix/] /y/]

This means that in the general case morpho-syntactic representations like (15a) cannot be successfully mapped onto a morpho-phonological form. Consider, for example, the case of left-headed Italian compounds. Some examples are given in (16).

(16) a. carta regalo
paper gift
'wrapping paper for presents'
b. carta carbone
paper carbon
'carbon paper'

These compounds resist further word formation with most, if not all, derivational suffixes. Although *carta* can be derived by *-iere*, *-aio* and *-ista* (see (17)), the forms in (18) and (19) are all ungrammatical (Vieri Samek-Lodovici, personal communication).

(17) a. cart-iere
paper seller
b. cart-aio
paper worker
c. cart-ista
paper specialist

(18) a. *carta regal-iere
a'. *cart-iere regalo
b. *carta regal-aio
b'. *cart-aio regalo
c. ??carta regal-ista
c'. *cart-ista regalo

(19) a. ??carta carbon-iere
a'. *cart-iere carbone
b. ??carta carbon-aio
b'. *cart-aio carbone
c. ?carta carbon-ista
c'. *cart-iste carbone

As already mentioned, languages may have subdomains of word formation in which the effects of one or more mapping principles can be suppressed. In the case of Italian, this is true of the plural (and perhaps also the diminutive). A morpho-syntactic structure [[$_N$ N X] PLURAL] is mapped onto a morpho-phonological representation at the cost of violating some mapping principle. There is a clear preference to sacrifice linear correspondence, rather than input correspondence:

(20) a. cart-e regalo
a'. *carta regal-i
b. cart-e carbone
b'. *carta carbon-i

This preference is language-specific. As Scalise (1988) notes, Somali has left-headed compounds which are inflected on the second constituent (the nonhead).

We have claimed that even in those subdomains of word formation that allow violation of mapping principles, such violation does not come for free. With respect to pluralization of compounds, for example, we know of no languages in which a right-headed compound is marked for plural by a suffix on the left-hand constituent (the nonhead), a situation which would involve gratuitous violations of both input correspondence and linear correspondence. Compare Scalise's typological schema for inflected compounds:

(21) a. head to the right; inflection to the right (occurs in English, Italian and Somali)
b. head to the left; inflection to the left (occurs in Italian)
c. head to the left; inflection to the right (occurs in Somali)

The missing option is indeed 'head to the right; inflection to the left'.

At least on one interpretation of linear correspondence and input correspondence, it seems that the input in (15a) can in fact be mapped without violating either. Suppose that the AFFIX is spelled out twice, both on the head and linearly external to the phonological correspondent of the left-handed compound:

(22) a. [[$_X$ X Y] AFFIX] ↔
b. [[/x/ /affix/] [/y/ /affix/]]

If the mapping principles in (11) and (12) require that *some* spell-out of the AFFIX occupies the relevant position in the morpho-phonology, (21b) satisfies both of them. Indeed, such double realizations occur. Scalise (1988) gives the example in (23a,b); similarly, *carta carbone* marginally allows (23c) as a plural.

(23) a. mezza notte
middle night
'the middle of the night'
b. mezz-e nott-i
middle-PL *night*-PL
c. ?cart-e carbon-i
paper-PL *carbon*-PL

However, given that the pattern in (23) is not the only one attested, there must also be a mapping principle that is violated by multiple phonological realization of a single AFFIX. This is stated in (24) (which is equivalent to Noyer's (1993) uniqueness principle):

(24) *Quantitative correspondence*
No element in the morpho-syntax is spelled out more than once.

Quantitative correspondence is independently motivated by the simple fact that, in absence of conflicting requirements (lexical or general), AFFIXes are not normally spelled out more than once. Thus, [/read/ /able/ /able/] does not exist alongside [/read/ /able/].[6]

3.3 *Predictions* Given that the mapping principles all refer to the phonological realization of elements in the morpho-syntax, it will matter a great deal whether the elements in question do in fact have a phonological realization. If either an AFFIX or the head of the category it selects do not, all mapping principles discussed so far are vacuously satisfied. Consider first the case in which the head X of the selected category fails to be spelled out (it is a zero morpheme). The /affix/ can obviously not form a phonological word with the nonexistent correspondent of this head. This does not mean that input correspondence is violated. Since the structural description of this rule states that 'X is phonologically realized as /x/', the condition is satisfied vacuously by the mapping in (25).

(25) a. $[[_X$ Y X] AFFIX] ↔
b. [/y/ /affix/]

Indeed, zero-derived words are themselves productively derivable (contra Myers 1984). For example, Don (1993) presents strong evidence that the Dutch verb stem *deel* 'divide' is derived from the noun *deel* 'part' by zero affixation.[7] Just like any other verb, $deel_V$ can be input to further derivation by overt deverbal affixes, giving rise to such forms as *deelbaar* 'divisible', *deler* 'divisor/divider', *deling* 'division', etc. The relevant mapping is given below for *deelbaar*:

(26) a. $[[_V [_N$ DEEL] $AFFIX_V]$ BAAR] ↔
b. [[/deel/ /baar/]]

Note that even if the assumed direction of conversion is incorrect, and the noun is derived from the verb, the same argument obtains: the noun, too, can be derived (cf. *gedeelte*, 'GE-part-TE' (part), *antideeltje* 'ANTI-part-DIM' (anti particle)).

In cases like (25), the phonological correspondent of the AFFIX forms a phonological word with the correspondent of the nonhead Y. Given that Y is the nonhead, special lexical mapping rules that normally affect the spell out of the combination Y-AFFIX do not apply. After all, such rules are conditioned by the AFFIX selecting a category headed by Y. For example, it can be argued that exocentric compounds such as *sabertooth* are really derived by zero affixation (Kiparsky 1982, Sproat 1988). Indeed, the structural description of the rule in (10) does not obtain if this noun is pluralized. The reason is that PLURAL selects a category headed by $AFFIX_N$ rather than TOOTH:

(27) a. $[[_N [_N$ SABER TOOTH] $AFFIX_N]$ PLURAL] ↔
b. [[/saber/ /tooths/]]
b'. *[[/saber/ /teeth/]]

The case in (27) can be contrasted with endocentric compounds headed by TOOTH. If the plural AFFIX selects such a compound, (10)'s structural description *is* met and hence the rule will apply:[8]

(28) a. [[BUCK TOOTH] PLURAL] ↔
b. *[[/buck/ /tooths/]]
b'. [[/buck/ /teeth/]]

Let us next consider the case in which it is not the head of a complex category selected by an AFFIX, but the AFFIX itself that is not overtly realized. Again, linear correspondence and input correspondence are vacuously satisfied with respect to this AFFIX. The prediction is that in such circumstances the position of the head of the selected category is irrelevant: it may follow or precede other overtly realized material. Both mappings in (29) satisfy all three mapping principles. In this respect, then, zero affixes impose fewer restrictions on their host category than overt affixes.

(29) a. $[[_X$ Y X] AFFIX] ↔
a'. [/y/ /x/]
b. $[[_X$ X Y] AFFIX] ↔
b'. [/x/ /y/]

A similar situation arises if the AFFIX is overtly realized as a phonologically independent element, rather than an /affix/. The point is that input correspondence states with what host an /affix/ should form a phonological word. It has nothing to say if an AFFIX is realized as a /word/. As a consequence, both mappings in (30) satisfy all mapping principles.

(30) a. $[[_X$ Y X] AFFIX] ↔
a'. [[/y/ /x/] /word/]
b. $[[_X$ X Y] AFFIX] ↔
b'. [[/x/ /y/] /word/]

The remainder of this paper explores the effects of the above view of the relation between morpho-syntax and morpho-phonology for the distribution of phrases below the word level. Section 4 begins by discussing cases like (29) and (30) where the affix combines with a syntactic maximal projection. In section 5, we argue that the acquisition of English synthetic compounds involves a similar structure in its earliest stages. In later stages, it involves violation of mapping principles in a particular subdomain of English word formation, which is discussed in more detail for the adult stage in section 6. Section 7 deals with cases in which an overtly realized AFFIX is attached to a phrase which is itself zero derived, resulting in structures comparable to (26). Section 8 discusses cases of phrasal derivation which are grammatical because the /affix/ and the phonological realization of the head of the phrase are adjacent. In section 9, it is shown that so-called mixed categories are just another instantiation of the constructions dealt with in sections 4 and 8. Section 10 contains a summary and evaluation.

4. *Affixes that aren't*

4.1 *Phrases embedded in words* Obviously, morpho-syntactic structures can be embedded in phrasal syntactic structures. Nothing we have said so far, however, precludes the opposite: the embedding of phrasal syntactic structures in morpho-syntactic ones, as in (31). Ruling this out would actually require an extra stipulation.

(31) $[_x$ YP X]

In compounds, phrases can indeed appear productively as the nonhead. The following Dutch examples demonstrate this (see also Hoeksema 1988 and Lieber 1992; Botha 1981 cites similar data from Afrikaans).

(32) a. een $[_N$ $[_{NP}$ ijs met slagroom] fobie]
an ice-cream with whipped-cream phobia

'an abhorrence of ice cream with cream'

b. een [$_{N}$ [$_{CP}$ doe dat nou niet] houding]
a do that now not attitude
'a discouraging attitude'

c. Ik prefereer [$_{N}$ [$_{PP}$ uit je bol] muziek]
I prefer out-of your head music
'I prefer music that thrills'

Given the option of incorporating a phrase into a compound, we might also expect phrases to show up as the nonhead in derived words. As noted above, there is no reason why AFFIXes should not attach to phrases, given that they do not select for any particular bar level. If an AFFIX corresponds to an /affix/, however, we predict phrasal affixation to be problematic if the phrase is not head-final and the /affix/ is a /suffix/ (or if the phrase is not head-initial and the /affix/ is a /prefix/). Consider (32a), where the AFFIX has a correspondent /suffix/. Input correspondence requires that this /suffix/ be combined with the correspondent of X, as in (32b). This, however, is only possible at the cost of violating linear correspondence, which favors (32c). Realizing the /suffix/ both adjacent to /x/ and at the right edge of the phrase, as in (32d), avoids this problem but in turn violates quantitative correspondence.

(32) a. [$_{XP}$ ... X YP] AFFIX
b. /x/ /affix/ /yp/
c. /x/ /yp/ /affix/
d. /x//affix/ /yp/ /affix/

Indeed, overt suffixation in Dutch normally cannot target a non-head-final phrase:

(33) a. [$_{N}$ [$_{N}$ BLOEM] IST]
flower ist
a'. [/bloem/ /ist/]
b. [$_{N}$ [$_{NP}$ BLOEM UIT AALSMEER] IST]
flower from Aalsmeer ist
b'. */bloem//uit/ [/aalsmeer/ /ist/]
b". *[/bloem//ist/] /uit//aalsmeer/[9]
b"'. *[/bloem//ist/] /uit/ [/aalsmeer//ist/]

The prediction that phrasal affixation should be well formed if the phrase *is* head-final will be explored in sections 8 and 9. First we consider cases of such affixation in which no mapping principle is violated because the AFFIX does not correspond to an /affix/ and cases in which violation of the mapping principles is idiosyncratically condoned in certain subdomains of word formation.

4.2 *AFFIXES corresponding to /word/s* As noted, an AFFIX may have a phonological counterpart which happens not to have selectional properties: although it spells out an AFFIX, it is not an /affix/, but a word-like element.[10] Arguably, this is the case for the Dutch suffixes *-achtig* 'like' and *-loos* 'less'. These seem to have selectional properties in syntax, given that they cannot occur as free forms:[11]

(34) a. Vind jij dat groen? *Nou, hooguit achtig.
Find you this green? Well, at-best like
'Do you think that is green? Well, somewhat like it at best.'

b. Staat er een panfluit op deze CD? *Nee, hij is godzijdank loos.

Are there pan pipes on this CD? No, it is mercifully less.
'Does this CD contain pan pipes? No, thank god it is without them.'

On the other hand, Van Beurden (1987:24) notes that "words derived by *-achtig* and *-loos* share characteristics with compounds rather than affixed structures". In particular, (i) *-achtig* and *-loos* are not stress-attracting, in contrast to the other adjectival suffixes in Dutch (Van Beurden 1987, De Haas & Trommelen 1993:312 ff.), (ii) they do not trigger resyllabification like other adjectival suffixes do, with the consequence that they feed final devoicing of their host (Booij 1977), and (iii) like the right-hand part of compounds, but unlike suffixes, they allow a preceding diminutive or a linking *s* (Van Beurden 1987:25). Some examples are given in (35).[12]

(35) *Stress shift with adjectival suffixes, but not with* -achtig *and* -loos

a.	víjand	vijándig	víjandachtig
	enemy	*enemy-y*	*enemy-like*
	'enemy'	'hostile'	'enemy-like'
	hártstocht	hartstóchtelijk	hártstochtsloos
	passion	*passion-ate*	*passion-less*

Resyllabification with adjectival suffixes, but not with -achtig

b.	[σ rood]	[σ roo] [σ dig]	[σ rood] [σ ach] [σ tig]
	red	*red-y*	*red-like*
	[σ vlees]	[σ vlee] [σ sig]	[σ vlees] [σ loos]
	meat	*meat-y*	*meat-less*

Final devoicing before -achtig *and* -loos*, but not before other adjectival suffixes*

c.	roo[t]	ro[d]ig	roo[t]achtig
	red	*red-y*	*red-like*
	vlee[s]	vle[z]ig	vlee[s]loos
	meat	*meat-y*	*meat-less*

Diminutive forms possible before -achtig *and* -loos*, but not before other adjectival suffixes*

d.	vogeltjes	*vogeltjes-ig	vogeltjes-achtig
	bird-DIM-PL	*bird-DIM-PL-y*	*bird-DIM-PL-like*
	koekjes	*koekjes-elijk	koekjes-loos
	cookie-DIM-PL	*cookie-DIM-PL-y*	*cookie-DIM-PL-less*

Linking s *possible before* -achtig *and* -loos*, but not before other adjectival suffixes*[13]

e.	toon	*twaalftoon-s-ig	twaalftoon-s-achtig
	tone	*twelve-tone-S-y*	*twelve-tone-S-like*
	hartstocht	*hartstocht-s-elijk	hartstocht-s-loos
	passion	*passion-S-ate*	*passion-S-less*

If *-achtig* and *-loos* are indeed to be characterized as /word/s rather than /affix/es, it follows from our view of m-selection that these suffixes can attach to non-head-final phrases without violating any of the mapping principles introduced in section 3. In particular, input correspondence is satisfied vacuously. Its structural description mentions an /affix/ - hence, if we are not dealing with an /affix/, the condition does not apply.[14] This prediction is borne out, as (36) shows. (As before, the phrases used are not head-final).

(36) a. zo'n [$_A$ [$_{CP}$ waar gaat dat heen] achtig] gevoel

such a where goes that to like feeling
'a somewhat worried feeling'

b. een [$_A$ [$_{PP}$ uit je bol] achtig] gevoel
a out-of your head like feeling
'a rather euphoric feeling'

c. een [$_A$ [$_{NP}$ ijs met slagroom] loos] bestaan
a icecream with whipped-cream less existence
'a life without icecream with cream'

d. een [$_A$ [$_{NP}$ dames met schoothondjes] loze] omgeving
a ladies with lap-dog-DIM-PL less environment
'an environment without ladies with little lap dogs'

So, Dutch adjectival suffixation provides a first illustration of the usefulness of distributed selection: attachment of an AFFIX to a phrase will not lead to violations of mapping principles (in particular input correspondence) if its phonological counterpart does not have selectional properties, for instance because it is a /word/ rather than an /affix/.

4.3 *AFFIXES that are not spelled out* This conclusion extends to cases in which an AFFIX does not have a phonological correspondent. It is predicted that attaching 'zero' affixes to phrases is unproblematic, since an /affix/ must be present if phonological selectional requirements (possibly leading to problems with mapping) are to be imposed. One phenomenon that bears out this prediction involves the semantic operation through which an expression becomes a name for itself. We will refer to this operation as 'auto-reference'. As the following Dutch examples show, almost any syntactic phrase can be turned into an auto-referential expression:

(37) a. Het 'wat is er nou weer aan de hand' dat altijd uit zijn kantoor schalt werkt op m'n zenuwen
the what is there now again on the hand that always from his office sounds works on my nerves
'The "now what?" that can always be heard coming from his office irritates me'

b. Men kon het 'drie bossen tulpen voor een tientje' al van verre horen.
one could the three bunches tulips for a tenner already from afar hear
'One could hear the "three bunches of tulips for a tenner" from afar'

Auto-referential expressions are not marked as such by an /affix/. However, there is a strong case for analyzing the operation that derives them as attachment of an AFFIX (compare Kruisinga 1932). The point is that autoreference changes the semantic and syntactic properties of the input phrase in a systematic way. First, whereas the embedded phrase may denote a question or proposition, the derived expression is referential. On a compositional view of semantics, this change in semantics must be encoded structurally. Second, auto-referential expressions in Dutch uniformly take the neuter determiner *het*, even if the embedded phrase would usually select the nonneuter determiner. This change in gender can be attributed to the abstract auto-referential head, which apparently is neuter.

(38) a. De/*het publicist is zeer populair
the-NONNEUTER/*the*-NEUTER *publicist is very popular*

b. Het/*de 'publicist' op pagina 3 zou ik liever vervangen door 'auteur'
the-NEUTER/*the*-NONNEUTER *publicist on page 3 would I rather replace by author*

Third, Pinker (1998) observes that idiosyncratic spell-out rules, such as the one for plural discussed in section 2, cannot apply to words that are used auto-referentially. Instead, the regular spell-out rule

for plural must be used (see (39)). This is because the autoreferential AFFIX destroys the context for application of the special rule: PLURAL does not attach to a category headed by TOOTH, but rather to one headed by this AFFIX. Hence, the analysis mimics that of *sabertooths*.

(39) a. Your teeth/*tooths look fine to me
b. There are too many 'tooths'/*teeth in this paper

Fourth, the operation involves a change in syntactic status, both with respect to category and level of projection. Its input may be a syntactic phrase of any category, but its output consistently shows the distribution of a nominal head, as the example in (40) shows.

(40) a. [$_{DP}$ Dat [$_{NP}$ eeuwige [$_{N'}$ [$_{N}$ [$_{CP}$ wat is er nou weer aan de hand] 0] van Jan]]] werkt op m'n zenuwen
that eternal what is there now again on the hand of John works on my nerves
'John's eternal "now what?" irritates me'
b. [$_{DP}$ Dat [$_{NP}$ eeuwige [$_{N'}$ [$_{N}$ hoestje] van Jan]]] werkt op m'n zenuwen
that eternal cough-DIM of John works on my nerves
'John's eternal cough irritates me'

As opposed to syntactic complementation, the morphological operations of compounding and affixation derive heads. However, compounding never involves null heads and its semantics varies in an unpredictable way. The formation of auto-referential expressions must hence be a case of zero affixation. This implies that the examples in (37) bear out the prediction that AFFIXes may attach to phrases without violating any mapping principle if not spelled out.

Further confirmation of this prediction comes from language acquisition, as we argue in the next section.

5. *The acquisition of synthetic compounds*

In nonmodular theories of affixation, one cannot make a distinction between the acquisition of an overt affix and the acquisition of its syntactic properties. For example, the syntactic and semantic properties of the English agentive suffix *-er* cannot be acquired prior to the acquisition of *-er* itself. Things are different if the process of affixation is distributed amongst different components. The option of forming subject names may well be universal, given its existence in a wide range of languages (see also Beard 1995). In other words, the availability of a morpho-syntactic agentive AFFIX, call it ER, may well be part of the initial stage. However, the phonological form that corresponds to this AFFIX clearly varies per language. This implies that children go through an acquisitional stage in which they have the option of forming subject names - they can attach the relevant AFFIX to a verbal category - even if they have not acquired the associated /affix/ of the adult language yet. We predict that children at that stage can produce subject names on the basis of non-head-final syntactic phrases. In contrast, adults who have a phonological correspondent to the agentive AFFIX cannot do so without violating a mapping principle

That children can form subject names on the basis of phrases is apparent from the acquisition of agentive synthetic compounds in English. As shown by Clark, Hecht & Mulford (1986), children use the VO order typical of English syntax in such compounds before they start using the /affix/ *-er*. (That children have not mastered *-er* yet during this early stage is shown by Clark & Hecht (1982): children initially produce forms like *wash-man* and *open-man* when asked to form a simple agentive noun on the basis of verbs like *to wash* and *to open*).[15] During this early stage, the forms that are produced when synthetic compounds are elicited are as in (41).

(41) *Stage I (around age 3): VO order, no overt affix*

a.	a kick-ball	(someone who kicks a ball)
b.	a build-wall	(someone who builds a wall)
c.	a bounce-ball	(someone who bounces a ball)

As noted by Clark et al. (1986:22), "essentially, what children at this stage appear to do is nominalize the *verb phrases* in the descriptions they hear" (their emphasis). These data thus confirm the view that AFFIXes can unproblematically attach to phrases as long as they have no overt correspondent.

If there is an overt correspondent to ER mapping problems will arise in case ER is attached to a non-head-final phrase. In the adult stage this generally does not occur. Rather, the relevant subject names are derived by synthetic compounding, which does not lead to problems with the mapping principles. However, in the development from the early stage I to this adult stage there is an intermediate stage in which the overt correspondent to ER has already been acquired, but the process of synthetic compounding is not yet available. In that stage, we witness a minimal violation of the mapping principles if the relevant type of subject name is elicited.

Consider what children must learn in order to reach the adult stage. As will be clear, they must acquire the phonological correspondent to ER. In addition a process of compounding must be introduced into their grammar. Following Lieber (1983) and Sproat (1985), we have argued elsewhere that agentive synthetic compounds in the adult language are derivatives of N-V compounds. *Truck driver* is thus assigned the following syntactic structure:[16]

(42) $[_N\ [_V$ TRUCK DRIVE] ER]

The process of compounding has not been not acquired yet in stage I, given that children do not produce subject names like *a ball-kick* in addition to the ones in (41) - such forms would result from attaching ER to a compound verb while not spelling out this AFFIX.[17]

There are two reasons for assuming that children face more difficulties in learning that English has N-V compounding than in learning that /er/ is the phonological realization of ER. First, whereas the existence of ER may trigger a search for an appropriate spell-out, no such trigger exists in the case of compounding. Second, whereas *-er* is a productive suffix and consequently relatively frequent in the child's input, compounds like those in (i) in footnote 16 are relatively infrequent. What we expect, then, is that after stage I there will be a stage in which /er/ is available to the child, but the operation of N-V compounding is not. As in stage I, the relevant morpho-syntactic structures are as in (43a); (43b) is still unavailable.

(43) a. $[_N\ [_{VP}$ $KICK_V$ $[_{NP}$ BALL]] ER]
b. $[_N\ [_V$ $BALL_N$ $KICK_V]$ ER]

However, ER has a phonological correspondent in stage II. Given the phonological selectional requirements imposed by /affix/es, (43a) can be mapped onto (44a), (44b) or (44c).

(44) a. $[[_\omega$ kick er] $[_\omega$ ball]]
b. $[[_\omega$ kick] $[_\omega$ ball er]]
c. $[[_\omega$ kick er] $[_\omega$ ball er]]

Each of these realizations violates a single mapping principle. We therefore expect the child to produce either one of these forms when forced to realize (43a). As explained in section 3, the mapping to (44a) violates linear correspondence, while (44b) and (44c) run counter to input correspondence and quantitative correspondence, respectively.

The predicted optionality indeed occurs. Clark et al. (1986:25) show that a second acquisitional stage starts around the age of four. ER is spelled out in this stage, but the verb and its

object still show up in the head-first order typical of English syntax. Children then produce forms as in (45a-c), as expected.

(45) *Stage II (around age 4): VO order, overt affix on either V, N or both (in order of decreasing frequency)*

a.	a giver-present	(someone who gives a present)
b.	a dry-hairer	(someone who dries hair)
c.	a mover-boxer	(someone who moves boxes)

Since (45a) occurs more often than (45b), which in turn appears more frequently than (45c), it seems that some ranking of the three mapping rules is necessary, with linear correspondence as the most easily violable one.[18] This is not something we will elaborate on, but we may point out that attachment of ER to a phrase and subsequent violation of linear correspondence by children is also required to explain data reported by Randall (1982). Randall shows that children can interpret *writer with a candy bar* as 'someone who writes with a candy bar', that is, as corresponding to a morpho-syntactic structure [[WRITE WITH A CANDY BAR] ER].)

Problems with mapping disappear when the child acquires the process of N-V compounding (as would be evidenced by the appearance of compounds like those in footnote 16 in this stage). This process makes available the morpho-syntactic structure in (43b), which can be mapped onto (46). In this representation, /er/ has a base to form a phonological word with without violating a mapping principle. The /affix/ is linearly external to /ball kick/, as required by linear correspondence, it is attached to /kick/, as required by input correspondence and ER is spelled out no more than once, as required by quantitative correspondence. This phonological realization hence becomes the norm in stage III, the adult state.

(46) [[$_{\omega}$ ball] [$_{\omega}$ kick er]]

Although subjects names are realized in various ways during acquisition, it is correctly predicted that form like (47) never occur. As pointed out in section 3, such forms violate linear correspondence and input correspondence gratuitously. They will be blocked by (46).

(47) [[$_{\omega}$ ball er] [$_{\omega}$ kick]]

Interestingly, infrequent forms of the type produced in stage I survive in the adult language. There is some idiosyncratic variation as to how ER is spelled out. Of course, the regular realization of [VERB ER] is */verb/-/er/*, but there are lexical exceptions. In (48a), for example, ER is spelled out by /ist/, which normally spells out denominal IST. In (48b) it is not spelled out separately, while (48c) is perhaps a case of complete suppletion.

(48) a. [TYPE ER] ↔ /type/+/ist/
b. [COOK ER] ↔ /cook/
c. [STEAL ER] ↔ /thief/

In line with section 3, idiosyncratic spell-out can be understood in terms of specific mapping rules (see the discussion of (10) and (11)). For example, /cook/ results from the rule given below, in conjunction with the regular spell-out rule for the verb COOK (recall that P(X) stands for the phonological realization of a (morpho-)syntactic entity X).

(49) If ER selects (a category headed by) COOK,

then P(COOK, ER) = P(COOK)

Suppose now that there is a specific mapping rule according to which ER is not spelled out when it combines with a particular verb-argument combination, as in (50).

(50) If ER selects [$_{\alpha}$ V N], where α is a projection of V
then P(α, ER) = P(α)

Usually if ER attaches to a V-N combination, this will give rise to a synthetic compound, for reasons just explained. However, if ER is not separately spelled out, its base may as well be a syntactic phrase with verb-object order since this will not lead to violations of any mapping principle. In other words, we expect that idiosyncratic subject names of the type just described can contain complete VPs. This is the case, as shown by the English examples in (51) (see also Bauer 1981:205). A similar observation can be made for Dutch (see (52)) and for French (see Lieber 1992:67). The relevant structures are comparable to the subject names produced in the English acquisitional stage I .[19]

(51) a. scare crow
b. pick pocket
c. know nothing
d. stay at home
e. pick me up

(52) a. weet al
know everything
'wise guy'
b. spring in 't veld
jump in the field
'madcap'
c. sta in de weg
stand in the way
'obstacle'

The Dutch examples consistently show verb-first order, which indicates that they are derived from CPs rather than VPs. See section 8 for some discussion.

To summarize, Clark et al.'s data are relevant for two reasons. First, as predicted by a modular view of selection, the acquisition of an /affix/ ultimately triggers a shift in the type of host the corresponding AFFIX takes. Once the overt affix is acquired, the option of attaching ER to a syntactic phrase disappears (except for idiosyncratic cases like (51), in which the regular spell-out rule for ER does not apply). Second, variation in the intermediate acquisitional stage II, as well as the absence of forms like *baller kick*, can be understood in terms of the three mapping rules proposed above. The effects of these mapping rules will be further explored in section 6.

6. *Subject names in the adult language*

Given the right circumstances, we may expect other instances of the type of forms found in acquisitional stages I and II to occur in the adult language. Recall that stage II arises as the result of the unavailability of N-V compounding to the child, while the phonological counterpart of ER, /er/, has already been acquired. Consequently, if certain other types of verbal compounding are absent in the adult language, so that the corresponding semantics can only be expressed syntactically, we expect subject names to pattern with stage II, rather than stage III.

An example of this are subject names derived from verb-particle combinations, as discussed by Sproat (1985). Although a particle and a verb can be combined syntactically, yielding verb-particle order, it is impossible to combine them in a particle-verb compound in English:

(53) a. to throw away
a'. *to away-throw
b. to stand in
b.' *to in-stand
c. to let down
c'. *to down-let

To be sure, English does have complex words that seem to consist of a preposition and a verb, but these are not related to the verb-particle construction. Examples are *outperform, overact* and *underfeed* (see Selkirk 1982:15). Such forms are clearly not morphological instantiations of the (nonexisting) verb-particle combinations **to perform out*, **to act over*, and **to feed under*. Indeed, verbs of this type do not even seem to be compounds; they rather appear to be derived by prefixation. First, they do not have compound stress (on the left), but share the rightward stress pattern of other prefixed verbs. Second, they have a specialized semantics, often associated with degree. Such specialization is typical of affixes, while the semantic relation between the head and nonhead of a compound is unpredictable. Third, not every preposition can occur in the preverbal position. As far as we know, there are no P-V complexes with for instance *away*, *in*, *about* and *across*. Such restrictions suggest that preverbal prepositions are listed as such, in contrast to the left-hand parts of compounds. It is reasonable to claim, then, that English lacks P-V compounds.

If so, the formation of subject names based on verb-particle combinations should be problematic in the adult language in the same way that synthetic compounding is during acquisitional stage II. Given a morpho-syntactic structure in which ER is attached to for instance CUT UP (cf. (54a)), the morpho-phonological structures in (54b-d) are available. Like (44a-c), (54b-d) violate linear correspondence, input correspondence and quantitative correspondence, respectively. If the synthetic compound *upcutter* would be available, these forms would be blocked, but given the absence of particle-verb compounding in English this form does not enter into the competition.

(54) a. [[CUT UP] ER]
b. [[$_\omega$ cut er] [$_\omega$ up]]
c. [[$_\omega$ cut] [$_\omega$ up er]]
d. [[$_\omega$ cut er] [$_\omega$ up er]]

Indeed, forms of this type are attested in adult English (see Bauer 1981:288-289 and Sproat 1985). (Which form is used in particular cases is subject to lexical variation and possibly to phonological conditions; the type in (55c) is the most frequent, as observed by Yip 1978).

(55) a. passer by
b. come outer
c. cleaner upper

It seems, then, that ER suffixation presents a subdomain of English morphology in which violations of mapping principles are sanctioned when forced (see section 3).

There is, in fact, a fourth way of realizing a syntactic structure in which ER is attached to a verb-particle combination. As noted in the previous section, spell-out of a SUFFIX can be suppressed on an idiosyncratic basis, giving rise to forms like *scare crow*. The same occurs with derivations of certain verb-particle combinations. An example is *stand in*, the subject name derived from the particle

verb *to stand in*. Since ER does not have a separate correspondent in (56b), all conditions on the placement of such a correspondent are satisfied vacuously.

(56) a. [[STAND IN] ER]
b. [[$_{\omega}$ stand] [$_{\omega}$ in]]

As said, a mapping as in (56) is only available if there is an idiosyncratic rule that suppresses the regular realization of ER (see (57)). The implication is that the pattern will not extend to all subjects names derived from particle verbs. This situation is comparable to the one found with subject names derived from verb-argument combinations, where there is a rule allowing idiosyncratic suppression of separate spell-out of ER in *scare crow* but not, for example, in **drive truck*.[20]

(57) If ER selects [$_{\alpha}$ STAND IN], where α is a projection of STAND
then P(α, ER) = P(α)

This situation contrasts with that obtaining when an AFFIX does not have a spell-out in the language at all. As with *stand in*, derivation with such an AFFIX does not lead to problems with respect to mapping, but in this case no idiosyncratic spell-out rule is required to achieve this. Indeed, syntactic verb-particle combinations productively undergo regular V to N conversion:

(58) [$_{N}$ make up] [$_{N}$ let down] [$_{N}$ push up]
[$_{N}$ give away] [$_{N}$ break in] [$_{N}$ break down]

Recapitulating, the contrast between subject names derived from verb-noun and verb-particle combinations originates in the fact that English has N-V but not Prt-V compounding. Consequently, synthetic compounds block any alternative realization of subject names derived from verb-argument combinations, while such alternative realizations can surface in the case of subject names derived from particle verbs.[21]

In this respect, there is an interesting contrast between English with Swedish. As in English, there are syntactic verb-particle combinations in Swedish, showing the expected head-first order (see (59)). However, there is also an option of combining verb and particle in a compound, so that the verb follows the particle (see (60)).

(59)	stiga upp	resa av	låna ut	somna in
	rise up	*travel off*	*lend out*	*sleep in*
	'to rise'	'to depart'	'to lend out'	'to fall asleep'
(60)	uppstiga	avresa	utlåna	insomna
	up-rise	*off-travel*	*out-lend*	*in-sleep*
	'to rise'	'to depart'	'to lend out'	'to fall asleep'

That the forms in (60) are compounds is apparent from three properties in which they contrast with English preposition-verb combinations (analyzed above as prefixed verbs). First, the forms in (60) display the stress pattern of compounds rather than prefixed verbs: stress falls on the particle (Gunlög Josefsson, personal communication). Second, the particles in (60) do not make a systematic contribution to the semantics of the particle-verb combination. This kind of semantic unpredictability is typical of compounds as opposed to prefixed verbs. Third, the range of prepositions that may precede the verb in structures like (60) is identical to the range of prepositions that may function as syntactic particles. This lack of restrictions is as expected of the left-hand part of compounds.

Given the availability of compounds of the type in (60), we expect subject names of verb-particle combinations to take the form of synthetic compounds. If ER is attached to a particle-verb compound, as in (61a), no principles are violated in the mapping to the phonological representation in (61b).

(61) a. [[PRT V] ER] ↔
b. [[ω /prt/] [ω /v/ /are/]]

Moreover, we expect that the patterns found with English derived particle verbs, which all violate a mapping principle, are ruled out in Swedish. This is correct, as (62) shows.

(62)	a.	angripare	utgivare
		on-clutch-er	*out-give-er*
		'attacker'	'publisher'
	b.	*gripanare	*givutare
		clutch-on-er	*give-out-er*
	c.	*gripare an	*givare ut
		clutch-er on	*give-er out*
	d.	*gripare anare	*givare utare
		clutch-er on-er	*give-er out-er*

We finally predict that Swedish children will go through an acquisitional stage comparable to the steady state for subject names of verb-particle combinations in English, namely when they have acquired the /affix/ that spells out ER but not yet the option of forming particle-verb compounds. As far as we know, there is no detailed study of the acquisition of subject names in Swedish, so that we do not know whether this prediction is borne out. However, the acquisition of participials indicates that the prediction may be on the right track. Before particle-verb compounding is acquired, children produce participles as in (63) (from Håkansson 1998:42), in violation of input correspondence. (The adult forms, after acquisition of particle-verb compounding, are the expected *uppätna* and *inlåsta*)

(63) a. ätuppna
eat-up-PART
b. låstinda
load-in-PART

In sum, the mapping between the syntactic and phonological structure of words is restricted by three conditions. Violation of these conditions is only allowed in language-specific subdomains of morphology, so that phrasal affixation is severely restricted. In the remainder of the paper we will argue that in two different types of circumstances phrasal affixation is possible without violating mapping principles. Under such circumstances it indeed occurs productively.

7. *Phrasal /affixation/*

We have argued that AFFIXes can take a full phrase as their input; it is their phonological counterpart that needs a word for its host. But not any word will do. Input correspondence requires that the host of an /affix/ corresponds to the category selected by the AFFIX, or to the head of that category if it is complex. It is this that rules out ungrammatical cases of phrasal affixation:

(64) a. [$_{Y}$ [$_{XP}$ X WP] AFFIX] ↔

b. */x/-/wp/-/affix/

Interestingly, the phonological representation in (64b) is not ruled out across the board. Although it violates input correspondence if associated with (64a), no mapping principles are violated if prior to the attachment of the overt affix a process of zero derivation takes place. In other words, the syntactic structure in (65a) can successfully be mapped onto the phonological one in (65b).

(65) a. $[_Z\ [_Y\ [_{XP}$ X WP] AFFIX-1] AFFIX-2] ↔
b. /x/-/wp/-/affix-2/

Linear correspondence is satisfied because /affix-2/ appears external to the material contained in Y and quantitative correspondence is satisfied because no element is spelled out more than once. As we will now argue, input correspondence, repeated below in (66), is satisfied as well:

(66) *Input Correspondence*
If an AFFIX selects (a category headed by) X,
the AFFIX is phonologically realized as /affix/, and
X is phonologically realized as /x/,
then /affix/ takes /x/ as its host.

AFFIX-2 in (65a) takes as its input a projection of AFFIX-1. Hence, (66) dictates that /affix-2/ must attach to the phonological correspondent of AFFIX-1, if there is one (as stated in the "if X is phonologically realized as /x/" clause). AFFIX-1 does *not* have a correspondent, however. The conditional nature of the constraint therefore implies that it is satisfied vacuously in (65). /Affix-2/ is consequently free to attach to any adjacent word.

We predict, then, that AFFIXes with an overt counterpart, which cannot freely attach to phrases because of mapping problems, *can* productively take zero-derived phrases as their input. This prediction turns out to be correct. As (67a-c) show, the English plural SUFFIX and the Dutch diminutive SUFFIX, which both have an overt correspondent, can be attached to phrasal subject names in which ER idiosyncratically fails to be spelled out; (67d) gives a similar case involving conversion of V to N; in (67e-f), finally, autoreferential AFFIXation is followed by attachment of a progressive-like PREFIX and an overt agentive SUFFIX, which are again spelled out.[22]

(67) a. [[[STAND IN] ER] PLUR] ↔
a'. [[ω stand] [ω in s]]
b. [[[SCARE CROW] ER] PLUR] ↔
b'. [[ω scare] [ω crow s]]
c. [[[SPRING IN HET VELD] ER] DIM] ↔
c'. [[ω spring] [ω in 't] [ω veld je]]
jump in the field DIM
'little madcap'
d. [[[PUSH UP] NOM] PLUR] ↔
d'. [[ω push] [ω up s]]
e. [PROG [[WAT IS ER NOU WEER AAN DE HAND] AUTOREF]] ↔
e'. [[ω ge wat] is er nou weer aan de hand]
GE what is there now again on the hand
'continuous saying "now what?"'
f. [[[BAN DE BOM] AUTOREF] ER] ↔

f'. [[ω ban] [ω de bom er]]
ban the bomb ER
'someone who adheres to the "ban the bomb" slogan'

Some evidence that the phonological structures are as indicated comes from English progressive assimilation. The pronunciation of the plural morpheme in examples like (67a',b',d') depends on whether the preceding consonant is voiced (see (67a,b)). Since such assimilation does not take place across word boundaries (see (67c)), the suffix must be part of the preceding phonological word.

(68) a. stand in[z], scare crow[z] (underlying /z/ surfaces)
b. push up[s], pick pocket[s] (progressive assimilation)
c. pick pocket [z]en training (no progressive assimilation)

The combination of facts discussed so far strongly supports a modular view of selection. Phrasal affixation is allowed either if the AFFIX does not correspond to an /affix/ or if the head of the selected category is not spelled out. Such sensitivity to the phonological realization of material cannot be expressed in frameworks in which selection is not modular, since such frameworks imply that zero morphemes and overt morphemes have the same m-selectional properties.

8. ***Phrasal*** *AFFIXATION*

The examples in (67) illustrate what one could call phrasal /affixation/: the phonological counterpart of a syntactic phrase hosts an /affix/. Still, due to the intermediate step of zero derivation, the examples do not involve phrasal AFFIXATION: AFFIX-2 in (65) combines with a head derived by AFFIX-1. There are circumstances, however, in which the mapping principles allow phrasal derivation by an overt affix. The mapping in (64) is infelicitous with respect to input correspondence because /wp/ intervenes between /x/ and the /affix/. Hence, if the derived phrase is head-final, the mapping to phonology should be unproblematic:

(69) a. $[_{Y}\ [_{XP}$ WP X] AFFIX] ↔
b. /wp/-/x/-/affix/

The grammaticality of (69) explains certain bracketing paradoxes which span morphology and syntax (see Pesetsky 1985, Sproat 1985, Di Sciullo & Williams 1987 and Spencer 1988). Some English examples are given in (70). In all these cases, the /suffix/ combines with the phonological correspondent of the head of the syntactic phrase that its syntactic counterpart combines with (this analysis echoes earlier work by Sproat (1985)).

(70) a. [[ATOMIC SCIENCE] IST] ↔
a'. [[ω atomic] [ω scient ist]]
b. [[GENERATIVE SYNTAX] IST] ↔
b'. [[ω generative] [ω syntac tician]]

Although supported by the interpretation of the examples at hand, it may not be immediately obvious that the syntactic bracketing is as indicated. The analyses advanced by Williams (1981) and Spencer (1988) assume that *atomic* and *generative* combine with *scientist* and *syntactician* respectively, on a par with examples like *crazy scientist* and *lazy syntactician*. On this view, the mismatch in bracketing paradoxes like the ones in (70) is between their morpho-syntactic structure and their semantics.

Such an analysis is implausible for comparable cases in Dutch, as we will now argue. The examples we will look at are given below.[23]

(71) a. [[KLASSIEK GITAAR] IST] ↔
[[ω klassiek] [ω gitaar ist]]
classical guitar ist

b. [[TRANSFORMATIONEEL GENERATIEF] IST] ↔
[[ω transformationeel] [ω generativ ist]]
transformational generative ist

c. [[FINANCIEEL ADVIES] ER] ↔
[[ω financieel] [ω advis eur]]
financial advice er

d. [[ROTTERDAMS KLAVERJAS] ER]
[[ω rotterdams] [ω klaverjas er]]
'*Rotterdam-style Klaberjass er*
'Someone who plays Klaberjass (a card game) in the Rotterdam way'

In Dutch, as opposed to English, prenominal modifiers are conjugated. In certain contexts, for instance if they are part of a definite DP, prenominal modifiers must end in a declensional schwa. The phenomenon is demonstrated in (72).

(72) a. de beroemd*(-e) gitarist
the famous(-DECL) guitarist

b. de productief*(-e) generativist
the productive(-DECL) generativist

c. de onbetrouwbaar*(-e) adviseur
the untrustworthy(-DECL) adviser

d. de slim*(-e) klaverjasser
the smart(-DECL) Klaberjass-player

In other contexts, such as the ones in (73), insertion of a declensional schwa is impossible. In the case of (73b,d), this is because we are dealing with adverbial, rather than adjectival modification. In (73a,c), the DP is indefinite.

(73) a. Hij speelt klassiek(*-e) gitaar
he plays classical(-DECL) guitar

b. Zijn onderzoek is transformationeel(*-e) generatief van aard
his research is transformational(-DECL) generative in character

c. Hij geeft financieel(*-e) advies
he gives financial(-DECL) advice

d. Zij wil altijd weer Rotterdams(*-e) klaverjassen
she wants always again Rotterdam-style(-DECL) Klaberjass
'Again and again she wants to play Rotterdam-style Klaberjass'

The competing analyses of bracketing paradoxes make different predictions about the distribution of the declensional schwa in examples like (71). Analyses based on Williams 1981 or Spencer 1988 would assign these examples and the ones in (72) identical syntactic representations. Such analyses hence predict that the adjectives in (71) must carry a declensional schwa in definite contexts. The analysis proposed here assumes that the adjective is part of an NP that does not host prenominal declension elsewhere (as (73) shows), and therefore no such declension is expected, not even when a definite determiner takes the entire structure as its complement. The data in (74) bear out the latter

prediction and thus confirm that overt suffixes may attach to head-final phrases. The asterisks indicate that the schwa cannot appear on the intended reading.[24]

(74) a. de klassiek(*-e) gitarist
the classical(-DECL) guitarist
b. de transformationeel(*-e) generativist
the transformational(-DECL) generativist
c. de financieel(*-e) adviseur
the financial(-DECL) adviser
d. de Rotterdams(*-e) klaverjasser
the Rotterdam-style(-DECL) Klaberjass-player

Note that adjectives modifying the person playing Rotterdam-style Klaberjass are declined regularly and hence end in schwa in the relevant context. Furthermore, they obligatorily precede modifiers of the card game:

(75) a. de bekend*(-e) Rotterdams(*-e) klaverjasser
the well-known Rotterdam-style Klaberjass-player
b. *de Rotterdams bekende klaverjasser
the Rotterdam-style well-known Klaberjass-player

The proposed analysis, which involves mismatches between morpho-syntax and morpho-phonology, is not necessarily appropriate for all paradoxes. Since a morpho-syntactic structure is not only mapped to a morpho-phonological representation, but also to a morpho-semantic one, a mismatch can occur in the latter mapping as well as the former. This gives rise to a second type of bracketing paradox that yields to an analysis along the lines of Beard 1991 and Williams 2002. Such bracketing paradoxes do not involve phrasal affixation. Indeed, the presence of the declensional schwa in the examples in (76) shows that the ER is attached to the verb rather than to a verbal phrase.

(76) a. een mooi*(-e) danser
a beautiful dancer
b. de warm*(-e) bakker
the warm baker
'the bread-seller who bakes the bread himself'
(not normally: 'the baker who is warm')

Further support for the option of overt suffixation of head-final phrases comes from the Dutch examples in (77). Although unusual, these examples are grammatical, a fact which can only be understood if their syntactic representations are as indicated. The point is that verbs follow, while nouns precede, their complements in Dutch. Consequently, the word order in (77) strongly suggests that the agentive AFFIX is attached to a VP. (If the nominalizing AFFIX were attached at the head level, the complement should occur on the right of the noun thus derived.)

(77) a. [[$_{VP}$ AAN DE WEG TIMMER] ER] ↔
a'. [[$_{\omega}$ aan] [$_{\omega}$ de weg] [$_{\omega}$ timmer aar]]
on the road hammerer
'careerist'
b. [[$_{VP}$ VAN MUGGEN OLIFANTEN MAAK] ER] ↔

b'. [[ω van] [ω muggen] [ω olifanten] [ω maak er]]
from gnats elephants maker
'someone who makes a fuss about little things'

The proposed analysis of (70), (71) and (77) rules out bracketing paradoxes of the relevant type if the derived phrase is not head-final (cf. (64)). It is therefore correctly predicted that examples like those in (77) will not occur in a VO language like English. It is also predicted that examples like (70) and (71) will be ungrammatical if the head of the NP that hosts the AFFIX is followed by a PP. As shown by (78), this is indeed the case.

(78) a. [[HISTORY OF SCIENCE] IST] ↔
a'. *[[ω history] [ω of] [ω scient ist]
b. [[AUTONOMY OF SYNTAX] IST] ↔
b'. *[[ω autonomy] [ω of] [ω syntac tician]]

In this light, it is interesting to compare the examples in (77) to the ones in (52). Deverbal AFFIXes can in principle attach to either VPs or CPs. Since Dutch is a verb-second language with head-final VPs, word order will be different in the two cases: verb-final and verb-initial, respectively.[25] This has direct repercussions for the realization of ER. As predicted, mapping to an /affix/ is unproblematic if ER has attached to a VP, but if it is attached to a CP, spell-out will violate either input correspondence or linear correspondence. It is no coincidence, then, that head-initial cases typically lack a separate spell-out of the nominalizing AFFIX, where as in head-final cases ER is usually spelled out. Compare for instance (52b), repeated here as (79), with (77).

(79) a. [[$_{CP}$ SPRING IN HET VELD] ER] ↔
b. [[ω spring] [ω in 't] [ω veld]]

To be sure, an AFFIX attached to a head-initial phrase could be spelled out as a /prefix/ without violating any mapping principle. However, it is a pervasive property of category-changing affixes, such as the ones under discussion, that they are realized as /suffix/es. The right-hand head rule is valid for a large number of languages and most potential counterexamples have received alternative explanations (see Neeleman & Schipper 1992 and references mentioned there). In all languages in which the right-hand head rule holds, then, the mirror image of (69) cannot exist. Of course, things should be different in languages with left-headed morphology. Although we will not go into this in any detail, Tagalog shows that, as expected, AFFIXes attached to a head-initial phrase can be spelled out by a /prefix/ in a language that has left-headed morphology (see Lieber 1992). The relevant construction concerns phrases (of various categories) that are verbalized. An example is given in (80) (from Schachter & Otanes 1972), where the verbalized phrase is *nasa akin* 'in my possession'.

(80) a. [$_{V}$ PA [$_{PP}$ NASA AKIN]] ↔
b. [[ω pu masa] [ω akin]
'come into my-possession'

In conclusion, AFFIXes spelled out as /suffix/es cannot attach to phrases, unless the phrase is head-final. Zero phrasal derivation, on the other hand, may apply to head-initial phrases as well, even if the morphology of the language is right-headed. This difference is further illustrated by properties of mixed categories.

9. *Mixed categories*

Although AFFIXes may in principle attach to syntactic categories of different levels, they often bring along semantic requirements that restrict this freedom. The AFFIX that derives subject names, for example, must bind the external θ-role of the head of its host. It can therefore not combine with verbal projections in which this role is already satisfied, as illustrated in (81).

(81) a. *a he-know(s)-all
b. *een zij-spring(t)-in-het-veld
a she-jumps-in-the-field

A similar requirement is imposed by the AFFIX that corresponds to /able/, which only takes inputs headed by verbs that have an unsaturated internal θ-role.

Restrictions of this type are not expected of AFFIXes that are thematically neutral. As long as the mapping principles are satisfied, AFFIXes that do not impose thematic requirements may attach to projections of various levels. As we will now argue, this provides a straightforward account of so-called mixed categories.

A mixed category is a phrase whose categorial features appear to change at some point in its projection line (see Jackendoff 1977, Abney 1987, Reuland 1988, Bresnan 1997, among many others). One example is the Dutch 'nominal infinitive' (see Hoekstra & Wehrmann 1985, Hoekstra 1986 and Van Haaften et al. 1986). This construction is headed by an apparently verbal form, the infinitive. It has the internal syntax of a VP up to a certain point, above which it behaves like an NP. The point at which the switch in category takes place can be located anywhere in the verb's projection line (contra Lapointe 1999):

(82) a. Deze zanger is vervolgd voor dat stiekeme jatten van succesvolle liedjes.
This singer is prosecuted for that sneaky pinch-INF of successful songs
b. Deze zanger is vervolgd voor dat stiekeme succesvolle liedjes jatten.
This singer is prosecuted for that sneaky successful songs pinch-INF
c. Deze zanger is vervolgd voor dat stiekem succesvolle liedjes jatten.
This singer is prosecuted for that sneakily successful songs pinch-INF

In (82a) the verbal projection is nominalized at the lowest level. Its head behaves like a noun in three respects: (i) it precedes its internal argument, which is a prepositional phrase, (ii) it is modified by an adjective (as is shown by the declensional schwa on *stiekem*, which never occurs on adverbs), and (iii) it follows a determiner. In (82b), the internal argument is a DP in pre-head position, the typical realization of the internal argument of a verb. It seems, then, that nominalization takes place after merger of the object. From this point upward, however, the phrase shows the same nominal characteristics as before. In (82c) nominalization takes place at yet a higher level, as indicated by the fact that the argument-verb combination is now modified by an adverb rather than an adjective (as is shown by the fact that *stiekem* does not carry a declensional schwa).

An analysis in terms of a projection that switches category predicts that no nominal elements are to be found below the level at which nominalization appears to take place, that is, below the level that still shows verbal syntax. Conversely, we do not expect *verbal* elements to be found *above* a level at which nominalization already appears to have taken place. Borsley & Kornfilt (2000) argue extensively that this prediction is correct. It is easy to illustrate this for the nominal infinitive. Once the projection in nominalized, as indicated by the presence of an adjective, subsequent merger of adverbials is barred (Hoekstra & Wehrmann 1985):

(83) a. Deze zanger is vervolgd voor dat constante stiekeme liedjes jatten.
This singer is prosecuted for that constant sneaky songs pinch-INF

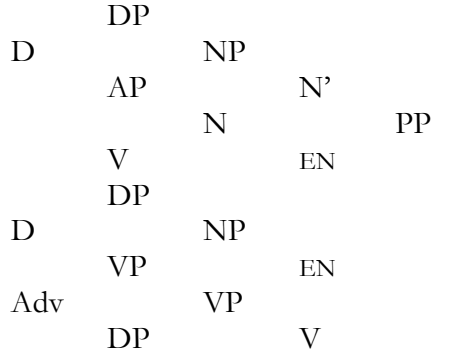
b. Deze zanger is vervolgd voor dat constante stiekem liedjes jatten.
This singer is prosecuted for that constant sneakily songs pinch-INF
c. *Deze zanger is vervolgd voor dat constant stiekeme liedjes jatten.
This singer is prosecuted for that constantly sneaky songs pinch-INF
d. Deze zanger is vervolgd voor dat constant stiekem liedjes jatten.
This singer is prosecuted for that constantly sneakily songs pinch-INF

So, an analysis of mixed categories in terms of a category change at variable levels is attractive enough.[26] One of the first to propose such an analysis was Jackendoff (1977), who introduced the 'deverbalizing rule scheme' in (84).

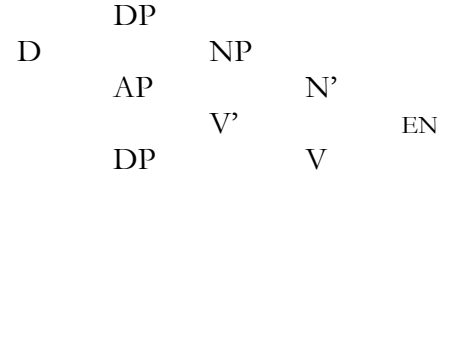
(84) $N^i \rightarrow V^i affix_N$

An important feature of most analyses based on something like (84) is that they identify '$affix_N$' with the overt affix that shows up on V. Thus, *-en* is seen as the spell-out of the nominalizing affix in Dutch nominal infinitives, which implies that the following structures hold of the examples in (82), where EN is the AFFIX that corresponds to /en/. (See Hoekstra 1986 and Van Haaften et al. 1986 for discussion.)

(85) a.



b.

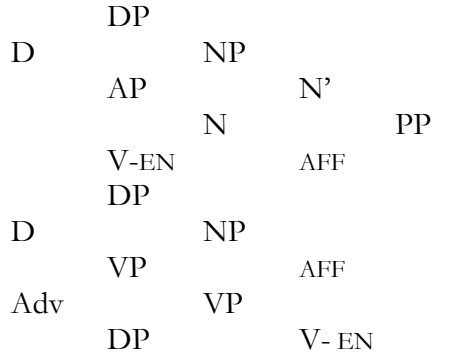


c.

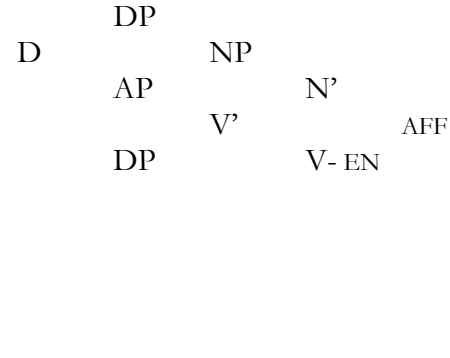
Although possible, this is not a very likely analysis. The point is that /en/ never spells out a category-changing AFFIX in any other case than this. Elsewhere it is the phonological realization of a non-category-changing infinitival marker. Thus, the proposed analysis is ad hoc: /en/ must be assumed to be associated with a nominalizing AFFIX, next to it being associated with the infinitival marker, only to account for the mixed category. (See Schoorlemmer 1999 for similar argumentation.)

If the overtly realized AFFIX is not responsible for the category change, but we do want to maintain the analysis of the nominal infinitive as derivation at various levels of the verbal projection, the most straightforward conclusion is that the construction involves a second AFFIX, which is not spelled out.[27] Hence, we analyze the examples in (82) as below.

(86) a.



b.



c.

Our view of m-selection makes clear predictions concerning the question in which languages the AFFIX involved in the derivation of a mixed category can be spelled out. Recall from section 7 that the mapping in (87) violates input correspondence while the mapping in (88) does not.

(87) a. $[_Y\ [_{XP}$ X WP] AFFIX] ↔
b. */x/-/wp/-/affix/

(88) a. $[_Y\ [_{XP}$ WP X] AFFIX] ↔
b. /wp/-/x/-/affix/

What we expect, then, is that mixed categories can involve overt suffixation of head-final syntactic phrases, while they must involve zero affixes in case the syntax is head-initial and the morphology characterized by the right-hand head rule (see also Lapointe 1999). Of course, head-final languages may also employ zero affixes (as is the case in the Dutch nominal infinitive), but they do not have to.

These predictions seem to be correct. Mixed categories in head-initial languages with head-final morphology appear to be systematically derived through zero affixation.[28] Perhaps the best-known mixed category is the English gerund, for which Jackendoff originally proposed the deverbalizing rule scheme.[29] As expected, gerunds are not marked by an overt nominalizing suffix.

(89) a. John's constant singing of the Marseillaise
b. John's constantly singing the Marseillaise

Like Dutch /en/, English /ing/ only seems to be related to a nominal AFFIX in the construction at hand. Elsewhere it corresponds to the AFFIX that derives the present participle.[30] An analysis of nominal gerunds as involving overt affixation must therefore rely on a homophony for which there is no independent evidence. Moreover, in (89b) /ing/ seems to appear internal to the phrase the corresponding AFFIX attaches to, which would constitute a violation of linear correspondence. These observations do not as such invalidate an analysis in terms of overt affixation, but an alternative that avoids these problems would be preferable. Following Yoon (1996), we therefore conclude that the construction is more plausibly analyzed as involving a zero nominalizing affix.

Essentially the same observations hold of the Spanish nominal infinitive, as Yoon & Bonet-Farran (1991) argue. As in English, verbal projections can be nominalized at various levels in Spanish without there being an overt nominalizing suffix:

(90) a. El tocar de la guitarra de María me pone nervioso
the play-INF of the guitar of Maria me makes nervous
'Mary's playing of the guitar makes me nervous'
b. El tocar la guitarra de María es muy elegante
the play-INF the guitar of Maria is very elegant
'Mary's playing the guitar is very elegant'
c. El cantar yo La Traviata traerá malas consecuencias
the sing-INF I La Traviata will-lead bad results
'my singing La Traviata will have bad consequences'

The suffix *-ar* that accompanies the verb in the examples in (90) spells out an infinitival AFFIX elsewhere. This implies that analyzing the structure as involving overt affixation would again require an otherwise unmotivated homophony. In addition, /ar/ appears internal to the phrase its assumed correspondent nominalizes in (90b,c), a conclusion strengthened by the observation that heads to

which /ar/ is attached behave like verbs in certain respects. For example, they can host verbal clitics, as in (91) (Yoon & Bonet-Farran 1991, Yoon 1996). This again shows that the corresponding AFFIX can be attached higher than the position of /ar/ suggests.

(91) Nuestro cantar-las le irrita
our sing-them him irritates
'Our singing them irritates him'

The pattern observed in English and Spanish contrasts with the one found in head-final languages. In mixed categories in such languages, the nominalizing AFFIX is frequently spelled out. For example, as noted by Yoon (1996:333), "in Korean, there is a dedicated nominalizing element (a suffix) used in phrasal nominalizations, which is also the affix found in (certain types of) lexical nominalizations". This is the suffix *-um*, as illustrated below. Crucially, this suffix never corresponds to a verbal AFFIX in the language, in contrast to English *-ing* and Spanish *-ar*.

(92) [[John-uy [chayk-ul ilk]-**um**]-i] nolawu-n sasil-i-ta
John-GEN book-ACC read-NOMINAL-NOM surprise-V.PRENOM fact-be-PRES-DECL
'John's reading the book is a surprising thing'

Similarly, Turkish nominalized phrases contain suffixes which Borsley & Kornfilt (2000:108) describe as "the realization of a nominal mood category". An example adopted from Erguvanli 1984:75 is given below. The relevant suffix is *-me*:

(93) On-dan [[dogru-yu söyle]-**me**-sin-i] bekle-r-di-m
he-ABL truth-ACC tell-NOMINAL-POSS3-ACC expect-AOR-PST-1SG
'I (would have) expected him to tell the truth'

Basque, a head-final language, spells out the nominalizing suffix as *-ari* in the example below (from Hornstein & San Martin 2000):

(94) Nik [anaia neskekin ibiltze]-**ari** ondo deritsot
I-ERG brother-ABS girls-with go out-NOMINAL.DET.DAT well consider-I
'I think that my brother going out with girls is ok'

Quechua mixed categories as described by Lefebvre & Muysken (1988:20-21) further strengthen the argument. Quechua is a language which has three (semantically distinct) spelled-out nominalizing AFFIXes in mixed categories, one of which is *-sqa*. In main clauses, the object can occur both to the right and to the left of the verb (see (95)), but in mixed categories the verb always has to be in final position, that is, adjacent to the nominalizing suffix (see (96)). This is exactly what one would expect under the present analysis.

(95) a. Xwan papa-ta mikhu-n
Juan potato-ACC eat-3
'Juan eats potatoes'
b. Xwan mikhu-n papa-ta
Juan eat-3 potato-ACC
'Juan eats potatoes'

(96) a. Xwan papa-ta mikhu-**sqa**-n-ta yacha-ni
Juan potato-ACC eat-NOMINAL-3-ACC know-I

'I know that Juan eats potatoes'

b. *Xwan mikhu-n papa-ta **sqa**-n-ta yacha-ni
Juan eat-3 potato-ACC NOMINAL-ACC know-I
'I know that Juan eats potatoes'

We conclude that mixed categories further confirm that phrasal derivation is possible in both OV and VO languages, but that the derivational AFFIX can only be spelled in the former.

In fact, the theory makes a further, negative, prediction. Suppose that a language is like Korean, Turkish, Basque and Quechua in having an /affix/ that corresponds to the nominalizing AFFIX employed in mixed categories. Suppose furthermore that it is like English and Spanish in having head-initial verbal projections and head-final morphology. Mixed categories in such a language would necessarily violate some mapping principle. The structure in (97a) cannot be felicitously mapped to either (97b) or (97b').

(97) a. $[[_{VP}$ V DP] AFF] ↔
b. */v/-/dp/-/aff/]
b'. */v/-/aff/-/dp/

We have seen earlier that mapping principles can be violated in certain subdomains of word formation if there is no grammatical alternative. Nominalizations of English verb-particle structures exemplify this. However, in the case of mixed categories, there *is* a grammatical alternative, namely one in which the nominalization takes place at the head level. The mapping from (98a) to (98b) is unproblematic.

(98) a. $[_{NP}$ $[_{N}$ V AFF] PP] ↔
b. /v/-/aff/-/pp/

The prediction, then, is that languages which have VO order and spell out the relevant AFFIX will not have mixed categories. This prediction seems to be correct. As Helge Lødrup (personal communication) informs us, in Norwegian the /affix/ used in productive nominalizations, *-ing*, can only correspond with a nominal AFFIX (unlike its homophonous English counterpart). As expected, the structures it derives have the external and internal syntax of NPs, rather than the mixed behavior found in English. The crucial example in (99) is ungrammatical.

(99) a. den ulovlige kopier**ing**en av populaere sanger
that illegal-DEF copying-DEF of popular-PL songs-PL
b. *den ulovlige kopier**ing**en populaere sanger
that illegal-DEF copying-DEF popular-PL songs-PL

Nonmodular theories of selection cannot very easily capture the distribution of overt affixes in mixed categories. Only if a difference is made between the selectional properties of AFFIXes and /affix/es is it possible to make sense of the fact that linear adjacency and overt realization influence the grammaticality of phrasal derivation.

In conclusion, we have argued in this paper that m-selection does not exist as a phenomenon separate from morpho-syntactic selection (instantiated by c-selection and the like) and morpho-phonological selection (instantiated by phonological clitics). Rather, m-selection occurs if these types of selection are combined. Under representational modularity, an element with m-selectional properties is a linked pair of an AFFIX and an /affix/. This reduction is not only conceptually

desirable, but also yields empirical results: it explains under which circumstances phrasal affixation is allowed.

Notes

1. There are precursors of this view in structuralist grammar, see for instance Hockett 1954. Also, as Jack Hoeksema (personal communication) points out, Montague grammar (Montague 1973) can be regarded as a model of this type. We may also note that the notion of correspondence rules is rather more common in other generative paradigms, in particular LFG (Bresnan 2000).

2. Precisely the fact that stranding appears to be possible in incorporating languages was a reason for Baker 1988 to assume a head-to-head movement analysis. (For a critical discussion of this argument, see Rosen 1989). Fu, Roeper & Borer 2001 argue for the presence of a VP in certain nominalizations in English on the basis of stranding of adverbials and *do so* ellipsis. Examples are given in (ia,b).

(i) a. [Kim's explanation of the problem thoroughly] was a big help
b. [Kim's explanation of the event] and [Bill's doing so] were surprising

However, the native speakers we have consulted find examples of this type ungrammatical.

3. Since class-1 and class-2 affixes display different morpho-phonological behavior, we may distinguish them phonologically. However, this does not require that they are attached at different levels in the morpho-syntax, which would require selection for some sort of bar level after all. The relative order of the two types of affixes does not warrant such a distinction in attachment level either. There are productive examples of orders with a class-1 affix outside a class-2 affix, such as nouns of the form A#*ize*+*ation* (Aronoff & Sridhar 1983). Instead, the ordering of affixes (at least in English) seems partially templatic in the sense that certain affixes impose particular restrictions on which other affixes they can follow (Fabb 1988).

4. To be sure, we do not claim that the existence of synonymy and homonymy as such is an argument for representational modularity, as all theories can deal with these phenomena. In fact, there is a strong tendency for overt forms to be linked to a single concept (Von Humboldt's principle), presumably as a result of acquisitional strategies. Thus, although *-ist* and *-er* are both nominalizing affixes that derive names of persons, they have different semantics and c-selectional properties. Hence, in our terms, /ist/ and /er/ correspond to two different AFFIXes. The type of evidence we will provide in favor of representational modularity is not based on synonymy or homonymy.

5. An anonymous reviewer remarks that Germanic particle verbs form a potential problem for this view. If particle verbs are morphological complexes, one might be tempted to analyze an inflected particle verb as involving a mapping of the type in (14): inflection is interpreted as taking scope over the whole particle verb, but it is spelled out on the head. The problem that such an analysis is confronted with is that particle verbs can be separated by movement rules like Verb Second. That is, verb and inflection are fronted, stranding the particle. It can be argued, however, that particle verbs are only morphological complexes when further derived; if not, they are syntactic, which ties in with their separability (Groos 1989, Ackema & Neeleman 2001). On this analysis, the inflectional AFFIX is attached to the verb only. That it takes wide scope is not surprising: inflection always does, as a result of syntactic mechanisms (either feature checking in functional projections or feature percolation).

6. There are some apparent counterexamples to quantitative correspondence (apart from violations motivated by a conflict with other mapping principles, to be discussed below). In Afrikaans, for example, there are double diminutives, such as *boon-tjie-tjie* (bean-DIM-DIM). Arguably, however, such

examples involve two AFFIXes. Whereas a form with a single diminutive means 'little N', doubling leads to a different meaning, namely 'very little N' (that is, 'little little N'). In other cases, such as Dutch *kind-er-en* (child-ER-PLUR), what is historically a plural marker has been reanalyzed as part of an allomorph of the stem. Hence, *kinder* is not a plural form, something that is corroborated by its occurrence in a derivation like *kinder-lijk* 'child-like' - the suffix *-lijk* does not normally combine with plural nouns.

7. The situation in Dutch is that there are regular and irregular verbs, and neuter and nonneuter nouns. Conversion pairs of nouns and verbs never involve an irregular verb and a neuter noun. Don explains this by assuming that conversion is directional. N-to-V conversion derives regular verbs, while V-to-N conversion derives nonneuter nouns. Note that such directionality effects are incompatible with analyses of conversion which do not involve derivation at all, but rather assume category neutral stems which can be inserted in verbal or nominal inflectional contexts (Myers 1984, Marantz 1997, Borer 2000).

8. A reviewer mentions the counterexample *tenderfoot*, whose plural can be *tenderfeet* as well as the expected *tenderfoots* (Anderson 1992). What seems to be the case, then, is that all compounds showing unexpected regular inflection are exocentric, but a few apparently exocentric compounds (also) allow inheritance of irregular inflection. We suggest that *tenderfoot*, for the relevant subset of speakers, is endocentric (not zero-derived), with the head of the compound receiving an exceptional *pars pro toto* reading. Such a reading is also available for simplex words, and hence independently motivated (cf. *all hands on deck!*).

9. Of course, *bloemist uit Aalsmeer* 'florist from Aalsmeer' is fine, but it refers to someone from Aalsmeer who sells flowers, rather than to someone who sells flowers from Aalsmeer.

10. The reverse, a syntactically free form that corresponds to an /affix/ also occurs. Simple clitics can be analyzed along these lines. Moreover, Andrew Spencer (personal communication) points out that the final morpheme in *postman*, typically pronounced without a full vowel, may also qualify as such. (See also footnote 14).

11. Sentences like this could still be generated if there were stems that lack a phonological form. The /affix/es in question are phonological words and hence do not need to attach to a host category, while the selectional requirements of their morpho-syntactic counterparts would be satisfied by the STEM. However, there is no such thing as a zero stem - something we think may have a functional explanation - so the issue does not arise.

12. The distinction between *-achtig* and *-loos* and the other adjectival suffixes is not the same as that between cohering and noncohering affixes in the sense of Booij 2001. Cohering affixes form a closer prosodic unit with their host than noncohering ones. In particular, as opposed to the latter, the former cannot be independent syllables and hence resyllabify with their host. Our proposal entails that within the group of noncohering affixes, there is another bifurcation. Some noncohering affixes are independent phonological words (*-achtig* and *-loos*), while others form a phonological word with their host. Examples of the latter type are adjectival *-baar* and nominal *-dom*. Although Booij assumes that all noncohering affixes are independent phonological words, the behavior of *-achtig* and *-loos* is different from the other ones. First, like the other adjectival suffixes *-baar* attracts stress. In this it differs from *-achtig* and *-loos*, and from nouns in compound structures. Thus, the examples in (i) form a minimal pair, which is unexpected if the suffix forms an independent phonological word in the same way that the free noun *baar* 'stretcher' does. Similarly, whereas *-achtig* and *-loos* can be preceded by an unambiguous linking phoneme (see footnote 13), the other noncohering suffixes cannot (see

(ii)).

(i) a. [[uit kláp] baar]
out fold able
'collapsible'
b. [[úit klap] baar]
out fold stretcher
'stretched that can be folded out'

(ii) a. [hertog(*-s) dom]
duke(-S)dom
'duchy'
b. [werk(*-e) baar]
work(-E) able

13. Note that often it is unclear whether one is dealing with a linking phoneme or a plural. However, in the examples given here *s* cannot be a plural: the plurals of *toon* and *hartstocht* are formed with *-en*.

14. English possessive *-s* also attaches to phrases, despite obviously being an /affix/ (cf. *The king of England's head*). This can be explained if *-s* does not spell out an AFFIX, but a syntactically free form (on a par with the possessive pronoun in Dutch examples like *Jan z'n book* 'John his book' (John's book)). This is comparable to Zwicky's (1977) analysis. On that analysis, input correspondence does not come into play, and hence the /affix/ is free to attach to the /word/ that happens to be left-adjacent to it.

15. That is, children do not show any consistent use of *-er* in their production. Of course, this does not necessarily mean that they have not acquired passive knowledge of it. This is irrelevant for the point we want to make here, however. The crucial thing is whether or not the children use the overt /affix/ in their own utterances. Obviously, the /affix/ can only induce selectional requirements when used.

16. An obvious counterargument to this view, namely that *truck-drive* does not occur as an independent compound in English, is addressed in Ackema 1999b and Ackema & Neeleman 2001. The latter paper explains why, although N-V compounds do exist in English (see (i)), N-V compounds in which the noun is the internal argument of the verb only occur if further derived. They do not surface as such, due to a blocking effect induced by the syntactic (VP) realization of the verb-argument combination. The analysis also explains why the blocking effect does not extend to synthetic compounds and syntactic counterparts involving inheritance, that is, why *truck driver* and *driver of trucks* co-exist.

(i) to breast-feed to hand-make
to base-generate to chomsky-adjoin

An empirical argument for a structure as in (42) can be based on idioms. There are cases in which the idiomatic reading associated with a verb – noun combination is lost under inheritance, but is retained in the synthetic compound. If the synthetic compound is another instance of inheritance (if it has a [N [V er]] structure) this is unexpected.

(ii) a. John makes a lot of trouble
b. John is a real troublemaker
c. *John is a real maker of trouble

17. Note that compounding is not a universal option in the way that some morphological operations encoded by AFFIXes may be. Even in a language that has compounding, there can be seemingly arbitrary gaps. English, for example, has both compounds with verbs as left-hand part (e.g. *swearword*) and compounds with adjectives as right-hand part (e.g. *honey-sweet*), but it nevertheless lacks V-A compounds (Selkirk 1982:15). V-A compounding also is not universally impossible, however; Dutch, for example, has compounds like *fonkelnieuw* 'shine-new' and *druipnat* 'drip-wet'. It is not very surprising that compounding is not universal, as it is not the expression of a semantically regular operation as opposed to the operation that relates a predicate to a subject name. See Ackema & Neeleman 2001 for some more discussion on this issue.

18. The ordering cannot be couched in optimality-theoretic terms, unless the variation in forms is not found in individual children, but only as a property of the whole population. Optimality-theoretic ranking implies that only one form should be grammatical.

19. The same may be possible with other AFFIXes, for example ING: *you better behave or you'll find out what I mean by a smack bottom*.

20. Some nouns zero-derived from verb-particle combinations are object names rather than subject names (cf. *a throw away*, *a handout*). Plausibly, these also involve affixation with ER , since this affix is independently known occasionally to derive object names when spelled out (Booij 1986, Beard 1988).

21. The absence of particle-verb compounds in English seem to imply that forms like **upcutter* should not occur at all. Unexpectedly, *onlooker*, *bystander*, *outlier* and *inswinger* instantiate exactly this pattern. We propose the following account. It is in the spirit of representational modularity to assume that there is no linear order in (morpho-)syntax. Thus, the right-hand head rule and the OV/VO parameter are mapping principles that determine the order in which a head and its dependents are spelled out (see Sproat 1985 for morphology and Neeleman & Weerman 1999 for syntax). On this view, violation of the head-first nature of English is a violation on a par with violations of the other mapping principles. This means that (i) illustrates another way of realizing subject names of verb-particle combinations. It satisfies the three mapping principles discussed earlier, at the cost of spelling out verb and particle in the wrong order.

(i) a. [[LOOK ON] ER]
b. [[$_{\omega}$ on] [$_{\omega}$ look er]]

So, examples of this type differ crucially from synthetic compounds like *truck driver*. The latter are derived compounds. They therefore do not violate any mapping principles and hence block other possible realizations. In contrast, forms like *bystander* are based on syntactic combinations spelled out incorrectly. Consequently, they do not block other realizations. Indeed, *onlooker* coexists with *looker on*.

22. Since the PREFIX corresponding to *ge-* attaches to verbs, not nouns, (67e) must in fact involve two instances of zero derivation before prefixation takes place: the nominal head derived by the autoreferential AFFIX undergoes N-to-V conversion first. The verb thus derived indeed exists,

witness an example like *zit toch niet de hele tijd zo te wat-is-er-nou-weer-aan-de-hand-en* 'don't what now all the time' (lit. 'sit not the whole time to what-is-there-now-again-on-the-hand-INF'). A similar line of argumentation may apply to (67f,f'), since ER usually attaches to verbal categories.

23. According to Spencer (1988), such cases must involve a phrase listed in the lexicon. Hence, the impossibility of *a wooden guitarist*. We believe, however, that what is relevant is not so much lexical listing, but that a wooden guitar is not understood as a particular type of instrument. Imagine that someone invents a hydraulic guitar (a new type of instrument operated by a hydraulic pump). It seems to us that in those circumstances (ib) is grammatical on the relevant reading, even if one does not know about hydraulic guitars. Upon hearing (ib) it is more likely that one will ask what a hydraulic guitar is than how Bob came to be hydraulic. The same line of argumentation holds of (ii) and (iii). (An analysis for these cases along the lines of (71) is motivated by the absence of a declensional schwa on the adjective, see below.)

(i) a. Bob speelt al vanaf zijn derde hydraulisch gitaar
Bob plays already from his third hydraulic guitar
b. Bob is de hydraulisch gitarist van Bob and the Bananas
Bob is the hydraulic guitarist of Bob and the Bananas

(ii) a. Bob verdient zijn brood met historisch-collectief onderzoek
Bob earns his bread with historical-collective research
b. Bob is een historisch-collectivist van naam
Bob is a historical-collectivist of name

(iii) a. Daarnaast geeft hij ook prefixaal advies
In-addition gives he also prefixal advice
b. Bob is de prefixaal adviseur van de Nederlandse Taalunie
Bob is the prefixal advisor of the Dutch language-foundation

24. Some speakers treat *klassiek(-e) gitarist* as a semantic bracketing paradox, and hence allow a declensional schwa (see below).. This is impossible in case the modifier is an adverb rather than an adjective in the corresponding examples in (73). On the reading that does not involve a bracketing paradox, the declensional schwa is of course obligatory for all speakers. Thus, *de Rotterdamse klaverjasser* refers to a Klaberjass player from Rotterdam, while *de transformationele generativist* refers to a generativist who is transformational (if such a thing exist).

25. In the examples in (52) the verb is uninflected, but V-to-C is not in general a prerogative of verbs with finite inflection (see Johnson & Vikner 1994, Hoekstra 1997 and Hoeksema 1998 for discussion).

26. The literature contains at least three alternative lines of analysis. The first has it that in mixed categories a single affixed head projects an ambiguous set of categorial features (Van Haaften et al. 1986) or two different sets of categorial features (Reuland 1988, Lapointe 1999), thereby extending the theory of phrase structure specifically for these cases. The second denies that mixed categories are derived by affixation. Pullum (1991) proposes that in gerunds the projection changes category by itself as it were, on the basis of gerund-specific projection rules. Spencer (1999) develops a variant of this analysis in terms of argument structure. Since the properties of a mixed category can no longer be derived from the material it dominates, such analyses would seem to violate compositionality (if the change is semantic) or inclusiveness (if it is syntactic) – again, a qualitative extension of the theory in order to deal with these specific cases. The third line of analysis is based on the idea that lexical heads are not specified for category, and that the categorial properties of the

projected phrase are determined by the functional heads it contains (see Marantz 1997, Borer 2000 and Schoorlemmer 2001). Although such analyses satisfy inclusiveness, they face some other problems. First, they cannot account for the directionality of conversion. Don (1993) shows that V-to-N conversion and N-to-V conversion pairs differ crucially, something which approaches of this type cannot capture. Second, such approaches do not allow nominalization at intermediate levels: only full lexical projections can be the complement of a nominal functional head. Hence, examples like (82b) and (83b) are unexpected. This problem can be solved at the cost of a sufficient number of verbal functional projections, namely one per XP that may accompany the lexical head (see Alexiadou 1997 and Cinque 1999). It is not obvious that such a proliferation of functional structure is desirable (see Bobaljik 2000 and Haider 2000 for discussion).

27. At this point, it should be noted that all examples of phrasal zero affixation we have discussed derive a nominal category. In contrast, phrasal zero derivation to a verbal category seems much rarer. An example from *The Long Goodbye* is given below:

(i) Three adjectives, you lousy writer. Can't you even [$_V$ stream-of-consciousness] you louse without getting it in three adjectives for Chrissake.

Similarly, a Dutch example like (ii) seems acceptable to us in the context of someone training for a black belt in some martial art. Note that *zwarte band* must be an NP rather than a nominal compound, given that the noun bears stress and the adjective is inflected.

(ii) Hij is elke avond aan het [$_V$ zwarte band]en
he is every evening on the black belt-INF
'He is training for his black belt every evening'

We do not know why phrasal conversion to V is so much rarer than phrasal conversion to N. For some relevant discussion, see Baker 2000. To complete the picture, we may note that phrasal conversion to A seems productive, at least in certain registers:

(iii) a. This is too [$_A$ last year] to wear
b. That music is so [$_A$ early eighties]

28. It is sometimes argued that past participles in languages like English are mixed categories, which, if correct, would be an obvious counterexample to this claim. However, phrases headed by a past participle are not mixed categories. Instead, there are two participles, one adjectival and the other verbal (the latter being historically related to the former). The adjectival participial heads a phrase which is fully adjectival, the verbal participle heads a phrase which is fully verbal - but a participle never heads a phrase that changes category midway. For arguments, see Wasow 1977, Williams 1982 and Ackema 1999a.

29. A curious property of the English gerund is that the equivalent of (82b) is impossible. If the nominalization involves more than just the head, modification by an adjective is impossible: *John's *constant/constantly singing the Marseillaise is terrible* (see Pullum 1991). Wescoat (1994) and Malouf (1998) note, however, that until the beginning of the 20th century examples like *the untrewe forgyng and contryvyng certayne testamentays* and *my wicked leaving my father's house* are in fact attested. We do not know why these have disappeared, but speculate that it might be related to ease of parsing. Upon hearing *John's constant singing*, the hearer will analyze *singing* as a noun. The following DP is consequently unexpected and necessitates reanalysis of the head as verbal. This problem does not arise in an OV-

language like Dutch, where the DP appears before the head, that is, before the hearer has to decide whether this is a verbal or a nominal head. (Note that English has changed from an OV to a VO language, a change that predates the loss of the mentioned construction.)

30. A different matter is that the present participle itself has a verbal and an adjectival incarnation (cf. *a slowly revolving planet* vs. *an uncompromising attitude*). As is the case with past participles (footnote 28), this does not give rise to mixed categories. The verbal present participle heads a VP, the adjectival one an AP (see Bennis & Wehrman 1990). The relevant ambiguity can be captured in various ways. For example, ING could be [+V] in the lexicon, a categorial specification that must be supplemented upon merger to yield either [+V,-N] or [+V,+N]. Note that such an underspecification still does not allow ING to be construed as the nominalizing affix in mixed categories.

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